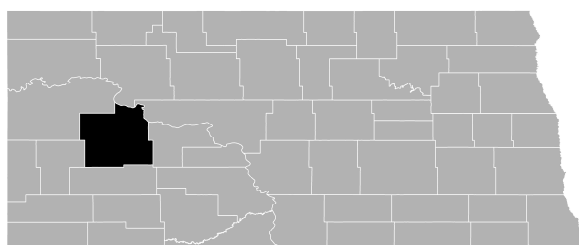


# FLOOD INSURANCE STUDY

## FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1



## DUNN COUNTY, NORTH DAKOTA

### UNINCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
DUNN COUNTY UNINCORPORATED AREAS	380026



# FEMA

**PRELIMINARY**

**March 10, 2016**

**REVISED:**

FLOOD INSURANCE STUDY NUMBER  
**380026V000A**

Version Number 2.3.3.0

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Gumbo Creek	02-04 P
Spring Creek	05-11 P
Spring Creek Breakout Channel	12-14 P

### Published Separately

Flood Insurance Rate Map (FIRM)

# **FLOOD INSURANCE STUDY REPORT DUNN COUNTY, NORTH DAKOTA UNINCORPORATED AREAS**

## **SECTION 1.0 – INTRODUCTION**

### **1.1 The National Flood Insurance Program**

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after

the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

## 1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community’s regulations.

## 1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Unincorporated Areas of Dunn County, North Dakota.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

**Table 1: Listing of NFIP Jurisdictions**

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Dodge, City of	380027	10130201	N/A	City of Dodge FIS Report, 1983
Dunn Center, City of	380028	10110205	N/A	City of Dunn Center FIS Report, 1983
Dunn County, Unincorporated Areas	380026	10110101, 10110205, 10130201, 10130202	3800260025A <sup>2</sup> , 3800260050A <sup>2</sup> , 3800260075A <sup>2</sup> , 3800260100A <sup>2</sup> , 3800260125A <sup>2</sup> , 3800260150A <sup>2</sup> ,	

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
			3800260175A <sup>2</sup> , 3800260200A <sup>2</sup> , 3800260225A <sup>2</sup> , 3800260250A <sup>2</sup> , 3800260275A <sup>2</sup> , 3800260300A <sup>2</sup> , 3800260305A <sup>2</sup> , 3800260310A <sup>2</sup> , 3800260314B <sup>2</sup> , 3800260315B, 3800260320A, 3800260350A <sup>2</sup> , 3800260375A <sup>2</sup> , 3800260400A <sup>2</sup> , 3800260405A, 3800260410A, 3800260415A <sup>2</sup> , 3800260420A <sup>2</sup> , 3800260430A, 3800260435A, 3800260440A <sup>2</sup> , 3800260445A <sup>2</sup> , 3800260455A, 3800260460A, 3800260465A <sup>2</sup> , 3800260470A, 3800260500A <sup>2</sup> , 3800260525A <sup>2</sup> , 3800260550A <sup>2</sup> , 3800260575A <sup>2</sup> , 3800260600A <sup>2</sup> , 3800260625A <sup>2</sup> , 3800260650A <sup>2</sup> , 3800260675A <sup>2</sup> , 3800260700A <sup>2</sup> , 3800260725A <sup>2</sup> , 3800260750A <sup>2</sup>	
Halliday, City of	380029	10110205, 10130201	N/A	City of Halliday FIS Report, 1998

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Killdeer, City of	380030	10110205	N/A	City of Killdeer FIS Report, 1989
Three Affiliated Tribes, Fort Berthold Reservation <sup>1</sup>	380721A	10110101, 10110205	N/A	N/A

<sup>1</sup> No Special Flood Hazard Areas Identified

<sup>2</sup> Panel Not Printed

#### 1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 31, "Map Repositories," within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

The initial community FIS Report for Dunn County Unincorporated Areas became effective on March 1, 1984. Refer to Table 28 for information about subsequent revisions to the FIRMs.



- Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels. In addition, former flood hazard zone designations have been changed as follows:

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

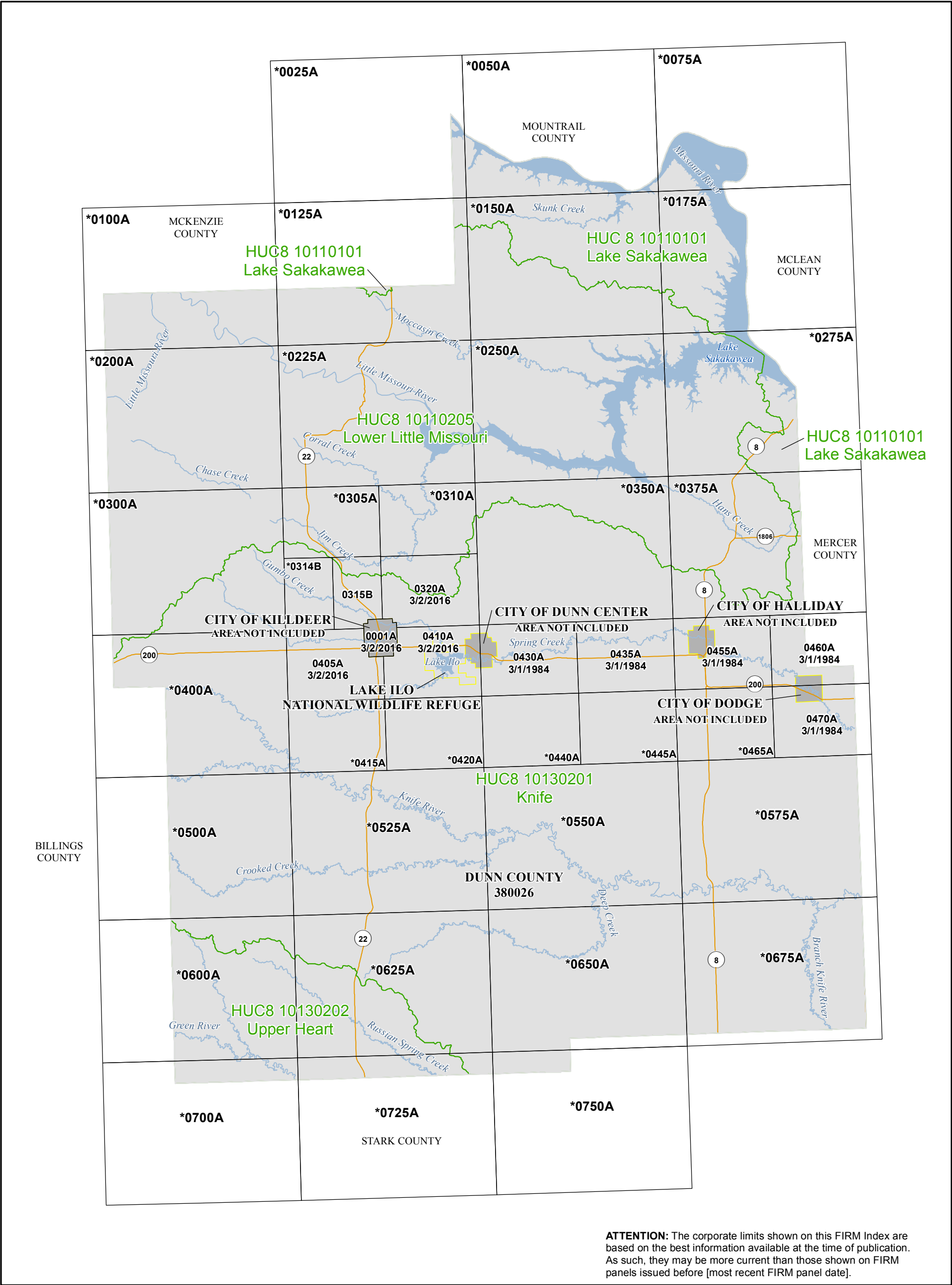
- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled “Mapping of Areas Protected by Levee Systems.”

Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database. For all other levees, the user is encouraged to contact the appropriate local community.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at <http://www.fema.gov>.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Dunn County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and United States Geological Survey (USGS) Hydrologic Unit Code – 8 (HUC-8) codes.

Figure 1: FIRM Panel Index



1 in = 6 miles 1:365,000

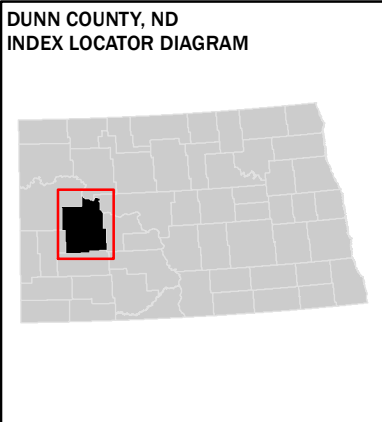
0 2.75 5.5 11 Miles

Map Projection:  
Universal Transverse Mercator Zone 13 North;  
North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT  
[HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

\*PANEL NOT PRINTED - AREA IN ZONE D



**NATIONAL FLOOD INSURANCE PROGRAM**  
FLOOD INSURANCE RATE MAP INDEX

DUNN COUNTY, NORTH DAKOTA Unincorporated Areas

PANELS PRINTED:  
0001, 0315, 0320, 0405, 0410, 0430, 0435, 0455, 0460, 0470

**FEMA**  
PRELIMINARY  
MAP NUMBER  
380026IND0A  
MAP REVISED

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

**Figure 2: FIRM Notes to Users**

## **NOTES TO USERS**

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 28 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**PRELIMINARY FIS REPORT:** FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

**BASE FLOOD ELEVATIONS:** For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

**FLOODWAY INFORMATION:** Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

## Figure 2. FIRM Notes to Users

**FLOOD CONTROL STRUCTURE INFORMATION:** Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

**PROJECTION INFORMATION:** The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 13. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

**ELEVATION DATUM:** Flood elevations on the FIRM are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

*NGS Information Services  
NOAA, N/NGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, Maryland 20910-3282  
(301) 713-3242*

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

**BASE MAP INFORMATION:** Base map information shown on the FIRM was provided via LOMR #15-08-0619P, dated March 2, 2016. Transportation information was derived from TIGER line files dated 2015. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

**Figure 2. FIRM Notes to Users**

**NOTES FOR FIRM INDEX**

**REVISIONS TO INDEX:** As new studies are performed and FIRM panels are updated within Dunn County Unincorporated Areas, North Dakota, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

**ATTENTION:** The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before *[most recent FIRM panel date]*.

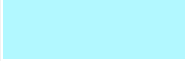
**SPECIAL NOTES FOR SPECIFIC FIRM PANELS**

This Notes to Users section was created specifically for Dunn County Unincorporated Areas, effective x/x/xxxx.


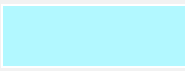






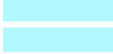




**FLOOD RISK REPORT:** A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in the Unincorporated Areas of Dunn County, North Dakota.

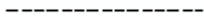


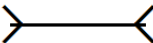

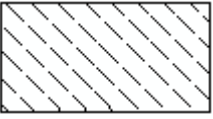



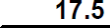

**Figure 3: Map Legend for FIRM**

<p><b>SPECIAL FLOOD HAZARD AREAS:</b> <i>The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.</i></p>	
	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone, either at cross section locations or as static whole-foot elevations that apply throughout the zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

**Figure 3: Map Legend for FIRM**
















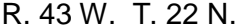
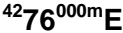

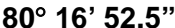
	Regulatory Floodway determined in Zone AE.
 	<p><b>Non-encroachment zone (see Section 2.4 of this FIS Report for more information)</b></p> <p><b>The Colorado River Floodway was established by Congress in the Colorado River Floodway Protection Act of 1986, Public Law 99-450 (100 Statute 1129). The Act imposes certain restrictions within the Floodway.</b></p>
<p>FLOOD INSURANCE IS NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER APRIL 8, 1987, IN THE DESIGNATED COLORADO RIVER FLOODWAY</p>	
<b>OTHER AREAS OF FLOOD HAZARD</b>	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.
<b>OTHER AREAS</b>	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible
	Unshaded Zone X: Areas determined to be outside the 0.2% annual chance flood hazard
<b>FLOOD HAZARD AND OTHER BOUNDARY LINES</b>	
 (ortho)  (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

**Figure 3: Map Legend for FIRM**

<b>GENERAL STRUCTURES</b>	
 Aqueduct Channel Culvert Storm Sewer	Channel, Culvert, Aqueduct, or Storm Sewer
 Dam Jetty Weir	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
 Bridge	Bridge
<b>COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA):</b> CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. <a href="#">See Notes to Users for important information.</a>	
 <b>CBRS AREA</b> 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 <b>OTHERWISE PROTECTED AREA</b> 09/30/2009	Otherwise Protected Area
<b>REFERENCE MARKERS</b>	
 22.0	River mile Markers
<b>CROSS SECTION &amp; TRANSECT INFORMATION</b>	
 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
 17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
 - - - - -	Coastal Transect



**Figure 3: Map Legend for FIRM**

	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
<b>ZONE AE (EL 16)</b>	Static Base Flood Elevation value (shown under zone label)
<b>ZONE AO (DEPTH 2)</b>	Zone designation with Depth
<b>ZONE AO (DEPTH 2) (VEL 15 FPS)</b>	Zone designation with Depth and Velocity
<b>BASE MAP FEATURES</b>	
	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
	Secondary Grid Crosshairs
	Name of Land Grant
	Section Number
	Range, Township Number
	Horizontal Reference Grid Coordinates (UTM)
	Horizontal Reference Grid Coordinates (State Plane)
	Corner Coordinates (Latitude, Longitude)

## **SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS**

### **2.1 Floodplain Boundaries**

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Dunn County Unincorporated Areas as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 23), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within the Unincorporated Areas of Dunn County, North Dakota, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 13. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

**Table 2: Flooding Sources Included in this FIS Report**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Alkali Creek	Dunn County Unincorporated Areas	Approximately 21.5 miles above mouth of Spring Creek	State Highway 200	10130201	2.8	N/A	N	AE	1982
Gumbo Creek	Dunn County Unincorporated Areas	City of Killdeer Corporate Limit	Approximately 1 mile upstream of City of Killdeer Corporate Limit	10110205, 10130201	1	N/A	Y	AE, X	2015
Spring Creek	Dunn County Unincorporated Areas	Approximately 17,280 feet downstream of 103 <sup>rd</sup> Avenue	Approximately 6,540 feet upstream of Spring Creek Road	10110205, 10130201	75	N/A	Y	AE, X	2015
Spring Creek	Dunn County Unincorporated Areas	Mercer/Dunn County line	Approximately 2 miles upstream of City of Killdeer Corporate Limit	10110205, 10130201	56	N/A	N	AE	1982
Spring Creek Breakout Channel	Dunn County Unincorporated Areas	Approximately 110 feet downstream of State Highway 200	Approximately 6,430 feet downstream of Spring Break Road	10130201	2.65	N/A	Y	AE, X	2015

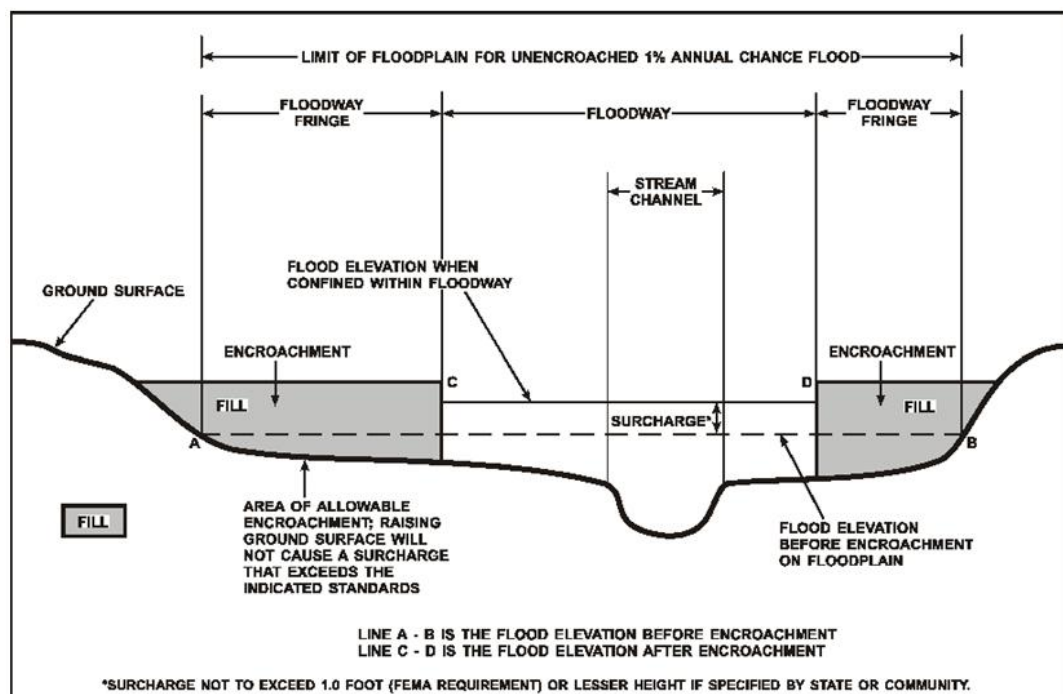
## 2.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard.

For purposes of the NFIP, a floodway is used as a tool to assist local communities in balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. Regulations for North Dakota require communities in Dunn County to limit increases caused by encroachment to 1.0 foot and several communities have adopted additional restrictions. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

**Figure 4: Floodway Schematic**



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 24, “Floodway Data.”

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

## **2.3 Base Flood Elevations**

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

## **2.4 Non-Encroachment Zones**

Some States and communities use non-encroachment zones to manage floodplain development. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event.

General setbacks can be used in areas of lower risk (e.g. unnumbered Zone A), but these are not considered sufficient where unnumbered Zone A is replaced by Zone AE. The NFIP requires communities to ensure that any development in a non-encroachment area causes no increase in BFEs. Communities must generally prohibit development within the area defined by the non-encroachment width to meet the NFIP requirement.

Non-encroachment determinations may be delineated where it is not possible to delineate floodways because specific channel profiles with bridge and culvert geometry were not developed. Any non-encroachment determinations for this FIS project have been tabulated for selected cross sections and are shown in Table 25, “Flood Hazard and Non-Encroachment Data for Selected Streams.” Areas for which non-encroachment zones are provided show BFEs and the 1% annual chance floodplain boundaries mapped as zone AE on the FIRM but no floodways.

## **2.5 Coastal Flood Hazard Areas**

This section is not applicable to this FIS project.

### **2.5.1 Water Elevations and the Effects of Waves**

This section is not applicable to this FIS project.

**Figure 5: Wave Runup Transect Schematic**  
**[Not Applicable to this Flood Risk Project]**

### **2.5.2 Floodplain Boundaries and BFEs for Coastal Areas**

This section is not applicable to this FIS project.

### **2.5.3 Coastal High Hazard Areas**

This section is not applicable to this FIS project.

**Figure 6: Coastal Transect Schematic**  
**[Not Applicable to this Flood Risk Project]**

### **2.5.4 Limit of Moderate Wave Action**

This section is not applicable to this FIS project.

## **SECTION 3.0 – INSURANCE APPLICATIONS**

### **3.1 National Flood Insurance Program Insurance Zones**

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in the Unincorporated Areas of Dunn County, North Dakota.

Figure 3, “Map Legend for FIRM.” Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in the unincorporated area of Dunn County, North Dakota.

**Table 3: Flood Zone Designations by Community**

Community	Flood Zone(s)
Dunn County, Unincorporated Areas	AE, D, X

### 3.2 Coastal Barrier Resources System

This section is not applicable to this FIS project.

**Table 4: Coastal Barrier Resources System Information**  
**[Not applicable to this Flood Risk Project]**

## SECTION 4.0 – AREA STUDIED

### 4.1 Basin Description

Table 5 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

**Table 5: Basin Characteristics**

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Lake Sakakawea	10110101	Lake Sakakawea	*	6,788
Lower Little Missouri	10110205	Little Missouri	*	1,804
Knife	10130201	Cannonball/Heart/Knife	*	2,503
Upper Heart	10130202	Cannonball/Heart/Knife	*	1,714

\* Data not available

### 4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for Dunn County Unincorporated Areas by flooding source.

**Table 6: Principal Flood Problems**

Flooding Source	Description of Flood Problems
All sources	Recent large floods from snowmelt runoff occurred in April 1952, March 1960, April 1969, and March 1972. Earlier floods occurred in 1902, 1913, 1939 and 1943. The duration of flooding usually ranges from 2-5 days for each notable event. Restrictive bridges, culverts, dense vegetation and an inadequate

Flooding Source	Description of Flood Problems
	channel all contribute to the severity of the potential flooding.
Spring Creek	Most of the flooding on Spring Creek occurs in the spring, usually in March and April. Large floods generally occur from spring snowmelt runoff due to winter accumulation of snow and frozen soil conditions. The resulting flood damage includes scoured land, washed-out fences, weakened roads and bridges, water-soaked buildings and personal property, and scattered debris.

Table 7 contains information about historic flood elevations in the communities within Dunn County Unincorporated Areas.

**Table 7: Historic Flooding Elevations**  
**[Not applicable to this Flood Risk Project]**

#### **4.3 Non-Levee Flood Protection Measures**

There are currently no flood protection measures in effect in the Unincorporated Areas of Dunn County. Levees are addressed in Section 4.4 of this FIS Report.

**Table 8: Non-Levee Flood Protection Measures**  
**[Not applicable to this Flood Risk Project]**

#### **4.4 Levees**

This section is not applicable to this FIS project.

**Table 9: Levees**  
**[Not applicable to this Flood Risk Project]**

## **SECTION 5.0 – ENGINEERING METHODS**

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3



in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

## **5.1 Hydrologic Analyses**

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 17.) Stream gage information is provided in Table 12.

**Table 10: Summary of Discharges**

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Alkali Creek	At Halliday	18.6	700	*	1,100	1,600	*	2,200
Gumbo Creek	At confluence with Spring Creek	30	970	*	2,030	2,550	*	3,980
Spring Creek	Below Dodge	377	3,500	*	6,900	8,800	*	12,600
Spring Creek	Below Halliday	329	3,200	*	6,300	8,100	*	11,200
Spring Creek	Below Werner	286	2,800	*	5,700	7,500	*	10,000
Spring Creek	Below Dunn Center	220	2,300	*	4,700	6,400	*	8,200
Spring Creek	At Dunn Center	132	1,600	*	3,300	4,500	*	5,800
Spring Creek	Below Killdeer	75	1,090	*	2,250	3,030	*	3,760
Spring Creek	At Killdeer	35	790	*	1,350	1,870	*	2,460
Spring Creek	Downstream of confluence with Gumbo Creek	72	1,637	*	2,556	2,904	*	4,045
Spring Creek	3,800 feet upstream of Spring Creek Breakout Channel	37	1,090	*	2,300	2,890	*	4,520
Spring Creek	900 feet upstream of Spring Creek Breakout Channel	37	1,090	*	1,561	1,647	*	1,851
Spring Creek	Downstream of Spring Creek Breakout Channel	37	1,077	*	1,366	1,394	*	1,675

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Spring Creek Breakout Channel	Confluence with Spring Creek	*	14	*	196	255	*	177 <sup>1</sup>
Spring Creek Breakout Channel	850 feet downstream of confluence with Spring Creek	*	14	*	935	1,497	*	2,846

\*Not calculated for this FIS project

<sup>1</sup>Reduced flow due to flow back into Spring Creek main channel from Spring Creek Breakout Channel

#### Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

#### Table 11: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

**Table 12: Stream Gage Information used to Determine Discharges**

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Knife River	06339100	USGS	Knife River at Manning, ND	205	08/01/1967	Present
Spring Creek	06340000	USGS	Spring Creek at Zap, ND	549	3/1/1924	Present

## 5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

**Table 13: Summary of Hydrologic and Hydraulic Analyses**

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Alkali Creek	*	*	Regression Equations	SCS WSP-2	1982	AE	Cross section data were developed photogrammetrically from aerial photographs flown in 1980. Field surveys were conducted to determine the geometry of all bridges and culverts used in computing water surface profiles.
Gumbo Creek	Approximately 550 feet downstream of 1033 <sup>rd</sup> Avenue	Approximately 1,080 feet upstream of State Highway 22	Log Pearson Type III	HEC-RAS	2015	AE w/ Floodway	No effective discharges for Gumbo Creek, the approach was to use Regional Egression Equations estimates at confluence with Spring Creek.
Spring Creek	*	*	Regression Equations	SCS WSP-2	1982	AE	Cross section data were developed photogrammetrically from aerial photographs flown in 1980. Field surveys were conducted to determine the geometry of all bridges and culverts used in computing water surface profiles.
Spring Creek	Approximately 17,280 feet downstream of 103 <sup>rd</sup> Avenue	Approximately 6,540 feet upstream of Spring Creek Road	Log Pearson Type III	HEC-RAS	2015	AE w/ Floodway	Spring Creek discharges were lowered based on the hydraulic split flow analysis that accounts for discharge through the Spring Creek Breakout Channel.
Spring Creek Breakout Channel	Approximately 110 feet downstream of State Highway 200	Approximately 6,430 feet downstream of Spring Creek Road	Log Pearson Type III	HEC-RAS	2015	AE w/ Floodway	This channel is not connected to the main Spring Creek channel during normal flow periods, but when Spring Creek overflows its banks in the vicinity of the Breakout Channel, flow can leave Spring Creek and flow around Killdeer via the breakout channel.

\*Not calculated for this FIS project

**Table 14: Roughness Coefficients**

Flooding Source	Channel “n”	Overbank “n”
Alkali Creek	0.045	0.065
Gumbo Creek	0.045	0.055
Spring Creek	0.045	0.040-0.1
Spring Creek Breakout Channel	0.045	0.055

### **5.3 Coastal Analyses**

This section is not applicable to this FIS project.

**Table 15: Summary of Coastal Analyses**

**[Not Applicable to this Flood Risk Project]**

#### **5.3.1 Total Stillwater Elevations**

This section is not applicable to this FIS project.

**Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas**

**[Not Applicable to this Flood Risk Project]**

**Table 16: Tide Gage Analysis Specifics**

**[Not Applicable to this Flood Risk Project]**

#### **5.3.2 Waves**

This section is not applicable to this FIS project.

#### **5.3.3 Coastal Erosion**

This section is not applicable to this FIS project.

#### **5.3.4 Wave Hazard Analyses**

This section is not applicable to this FIS project.

**Table 17: Coastal Transect Parameters**

**[Not Applicable to this Flood Risk Project]**

**Figure 9: Transect Location Map**

**[Not Applicable to this Flood Risk Project]**

## **5.4 Alluvial Fan Analyses**

This section is not applicable to this FIS project.

**Table 18: Summary of Alluvial Fan Analyses**

**[Not Applicable to this Flood Risk Project]**

**Table 19: Results of Alluvial Fan Analyses**

**[Not Applicable to this Flood Risk Project]**

## **SECTION 6.0 – MAPPING METHODS**

### **6.1 Vertical and Horizontal Control**

All FIS Reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS Reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS Reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NGVD29. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov), or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, N/NGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, Maryland 20910-3282  
(301) 713-3242

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please contact information services Branch of the NGS at (301) 713-3242, or visit their website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov).

**Table 20: Countywide Vertical Datum Conversion**

**[Not Applicable to this Flood Risk Project]**

**Table 21: Stream-by-Stream Vertical Datum Conversion**

**[Not Applicable to this Flood Risk Project]**

## 6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, [www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping](http://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping).

Base map information shown on the FIRM was derived from the sources described in Table 22.

**Table 22: Base Map Sources**

Data Type	Data Provider	Data Date	Data Scale	Data Description
Political boundaries, Surface water features	FEMA	2016	*	Municipal and county boundaries, water features from LOMR #15-08-0619P



Data Type	Data Provider	Data Date	Data Scale	Data Description
Transportation Features	U.S. Census Bureau, Geography Division	2015	*	Roads and railroads were downloaded from TIGER/Line data from the U.S Census Bureau
Public Land Survey System (PLSS)	State Center for Geographic Information	2005	1:24,000	PLSS data were digitized from USGS quadrangles

### 6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data".

**Table 23: Summary of Topographic Elevation Data used in Mapping**

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Scale	Contour Interval	Citation
Dunn County Unincorporated Areas	Alkali Creek Spring Creek	Aerial Maps	1:9600	*	SCS 1982

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Scale	Contour Interval	Citation
Dunn County Unincorporated Areas	Gumbo Creek, Spring Creek, Spring Creek Breakout Channel	LiDAR	*	1 ft	AE2S 2015

\*Not Calculated for this FIS project

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report.

**Table 24: Floodway Data**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NGVD)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	674	293	1,218	2.1	2,224.0	2,224.0	2,224.5	0.5
B-F <sup>2</sup>								
G	11,802	670	3,410	0.8	2234.9	2234.9	2235.9	1.0
H	13,672	719	1,706	1.5	2236.1	2236.1	2237.1	1.0
I	15,236	132	714	3.6	2238.2	2238.2	2238.9	0.7
J	16,654	152	856	3.0	2240.1	2240.1	2240.9	0.8

<sup>1</sup>Stream distance in feet above confluence with Spring Creek

<sup>2</sup>Within Extraterritorial Jurisdiction Limits of City of Killdeer

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
DUNN COUNTY, NORTH DAKOTA  
(UNINCORPORATED AREAS)

FLOODWAY DATA

FLOODING SOURCE: GUMBO CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	102.33	350	1,186	2.4	2,209.7	2,209.7	2,210.3	0.6
B	102.71	457	1,001	2.9	2,211.6	2,211.6	2,211.9	0.3
C	103.26	586	1,670	1.7	2,215.8	2,215.8	2,215.8	0.0
D	103.97	804	1,435	2.1	2,217.0	2,217.0	2,217.3	0.3
E	104.49	157	705	4.1	2,220.1	2,220.1	2,220.8	0.7
F	105.06	551	1,682	1.7	2,223.1	2,223.1	2,223.7	0.6
G	105.19	217	730	1.0	2,223.9	2,223.9	2,224.5	0.6
H-W <sup>2</sup>								
X	109.63	119	370	3.7	2,258.6	2,258.6	2,258.7	0.1
Y	110.23	60	290	4.7	2,263.6	2,263.6	2,264.5	0.9
Z	110.56	85	336	4.1	2,267.2	2,267.2	2,267.2	0.0
AA	111.00	117	339	4.0	2,272.4	2,272.4	2,272.4	0.0
AB	111.43	99	302	4.5	2,278.7	2,278.7	2,278.7	0.0
AC	111.93	65	322	4.3	2,285.2	2,285.2	2,285.2	0.0
AD	112.10	73	372	3.7	2,287.1	2,287.1	2,287.1	0.0
AE	112.41	68	258	5.3	2,291.0	2,291.0	2,291.0	0.0
AF	112.50	120	400	3.4	2,292.3	2,292.3	2,292.3	0.0
AG	113.02	744	1,497	1.9	2,299.4	2,299.4	2,299.4	0.0
AH	113.26	188	470	6.2	2,301.2	2,301.2	2,301.6	0.4

<sup>1</sup>Stream Distance in Miles above Mouth

<sup>2</sup>Within Extraterritorial Jurisdiction Limits of City of Killdeer

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
DUNN COUNTY, NORTH DAKOTA  
(UNINCORPORATED AREAS)

## FLOODWAY DATA

FLOODING SOURCE: SPRING CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	-108	60	307	5.0	2,272.5	2,272.5	2,27.31	0.6
B	109	102	631	2.4	2,273.1	2,273.1	2,273.8	0.7
C	482	92	503	3.0	2,273.4	2,273.4	2,273.9	0.5
D	750	119	746	2.0	2,274.7	2,274.7	2,275.6	0.9
E	3,209	70	456	3.3	2,276.4	2,276.4	2,277.2	0.8
F	5,556	53	285	5.3	2,279.5	2,279.5	2,279.9	0.4
G	6,837	77	429	3.6	2,281.1	2,281.1	2,281.5	0.4
H	7,921	153	611	2.5	2,283.3	2,283.3	2,283.8	0.5
I	10,105	86	547	2.8	2,288.0	2,288.0	2,288.9	0.9
J	11,281	457	1,148	1.3	2,289.4	2,289.4	2,290.2	0.8
K	12,950	445	702	2.2	2,292.1	2,292.1	2,292.1	0.0

<sup>1</sup>Stream Distance in Feet above mouth

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY  DUNN COUNTY, NORTH DAKOTA  (UNINCORPORATED AREAS)	FLOODWAY DATA
		FLOODING SOURCE: SPRING CREEK BREAKOUT CHANNEL

**Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams**

**[Not Applicable to this Flood Risk Project]**

#### **6.4 Coastal Flood Hazard Mapping**

This section is not applicable to this FIS project.

**Table 26: Summary of Coastal Transect Mapping Considerations**

**[Not Applicable to this Flood Risk Project]**

#### **6.5 FIRM Revisions**

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions to FIS projects may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 31, “Map Repositories”).

##### **6.5.1 Letters of Map Amendment**

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in a SFHA.

To obtain an application for a LOMA, visit [www.fema.gov/floodplain-management/letter-map-amendment-loma](http://www.fema.gov/floodplain-management/letter-map-amendment-loma) and download the form “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill”. Visit the “Flood Map-Related Fees” section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at [www.fema.gov/online-tutorials](http://www.fema.gov/online-tutorials).

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

### 6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA’s determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting [www.fema.gov/floodplain-management/letter-map-amendment-loma](http://www.fema.gov/floodplain-management/letter-map-amendment-loma) for the “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill” or by calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the “Flood Map-Related Fees” section.

A tutorial for LOMR-F is available at [www.fema.gov/online-tutorials](http://www.fema.gov/online-tutorials).

### 6.5.3 Letters of Map Revision

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit <http://www.fema.gov> and download the form “MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision”. Visit the “Flood Map-Related Fees” section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Unincorporated Areas of Dunn County FIRM are listed in Table 27.

**Table 27: Incorporated Letters of Map Change**

Case Number	Effective Date	Flooding Source	FIRM Panel(s)
15-08-0619P	03/02/2016	Gumbo Creek Spring Creek Spring Creek Breakout Channel	3800260320A, 3800260405A, 3800260410A

### 6.5.4 Physical Map Revisions

PMRs are an official republication of a community’s NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community’s chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a

review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit <http://www.fema.gov> and visit the “Flood Map Revision Processes” section.

### 6.5.5 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards within a given community. FEMA accomplishes this through a national watershed-based mapping needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS). The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit [www.fema.gov](http://www.fema.gov) to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

### 6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Dunn County Unincorporated Areas. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 28, “Community Map History.” A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.
- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or “pending” (for Preliminary FIS Reports) is shown. If the community is listed in Table 28 but not identified on the map, the community is treated as if it were unmapped.
- *Initial FHBM Effective Date* is the effective date of the first Flood Hazard Boundary Map (FHBM). This date may be the same date as the Initial NFIP Map Date.
- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.
- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community. This is the first effective date that is shown on the FIRM panel.
- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised



date that is shown on the FIRM panel, if applicable. As countywide studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as Physical Map Revisions (PMR) of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

**Table 28: Community Map History**

Community Name	Initial Identification Date (First NFIP Map Published)	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Dunn County Unincorporated Areas	03/01/1984	N/A	N/A	03/01/1984	

## SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

### 7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

**Table 29: Summary of Contracted Studies Included in this FIS Report**

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Alkali Creek, Spring Creek	03/01/1984	U.S. Soil Conservation Service/ Dames & Moore	N/A	1982	Dunn County Unincorporated Areas
Gumbo Creek, Spring Creek, Spring Creek Breakout Channel	TBD	Advanced Engineering and Environmental Services, Inc.	N/A	2015	Killdeer, City of, Dunn County Unincorporated Areas

### 7.2 Community Meetings

The dates of the community meetings held for this FIS project and any previous FIS projects are shown in Table 30. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

**Table 30: Community Meetings**

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Dunn County Unincorporated Areas	TBD	TBD	Final CCO	

## SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see <http://www.fema.gov>.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for Dunn County Unincorporated Areas, (FEMA 1984). In addition, the U.S. Soil Conservation published a Flood Hazard Analysis Report for Spring Creek in Dunn and Mercer Counties (SCS 1982). The City of Killdeer and Dunn County, North Dakota completed a floodplain re-study of Spring Creek, Gumbo Creek and Spring Creek Breakout Channel in 2015 (AE2S 2015).

Table 31 is a list of the locations where FIRMs for Dunn County Unincorporated Areas can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

**Table 31: Map Repositories**

Community	Address	City	State	Zip Code
Dunn County, Unincorporated Areas	Dunn County Courthouse 205 Owens Street	Manning	ND	58642

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 32.

Table 32 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the state NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of state and local GIS data in their state.

**Table 32: Additional Information**

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	<a href="http://www.fema.gov">http://www.fema.gov</a>
NFIP website	<a href="http://www.fema.gov/business/nfip">http://www.fema.gov/business/nfip</a>
NFHL Dataset	<a href="http://msc.fema.gov">http://msc.fema.gov</a>

FEMA Region VIII	Denver Federal Center, Building 710, Denver, CO 80225 303-235-4800
Other Federal Agencies	
USGS website	<a href="http://www.usgs.gov">http://www.usgs.gov</a>
Hydraulic Engineering Center website	<a href="http://www.hec.usace.army.mil">http://www.hec.usace.army.mil</a>
State Agencies and Organizations	
State NFIP Coordinator	Dionne Haynes, CFM North Dakota State Water Commission 900 East Boulevard Avenue Bismarck, ND 58505 701.328.4961 <a href="mailto:dfhaynes@nd.gov">dfhaynes@nd.gov</a>
State GIS Coordinator	Bob Nutsch Information Technology Department 600 East Boulevard, Department 112 Bismarck, ND 58505 701.328.3212 <a href="mailto:bnutsch@nd.us">bnutsch@nd.us</a>
State Mapping Coordinator	Laura Horner North Dakota State Water Commission 900 East Boulevard Avenue Bismarck, ND 58505 701.328.2759 <a href="mailto:lmhorner@nd.gov">lmhorner@nd.gov</a>

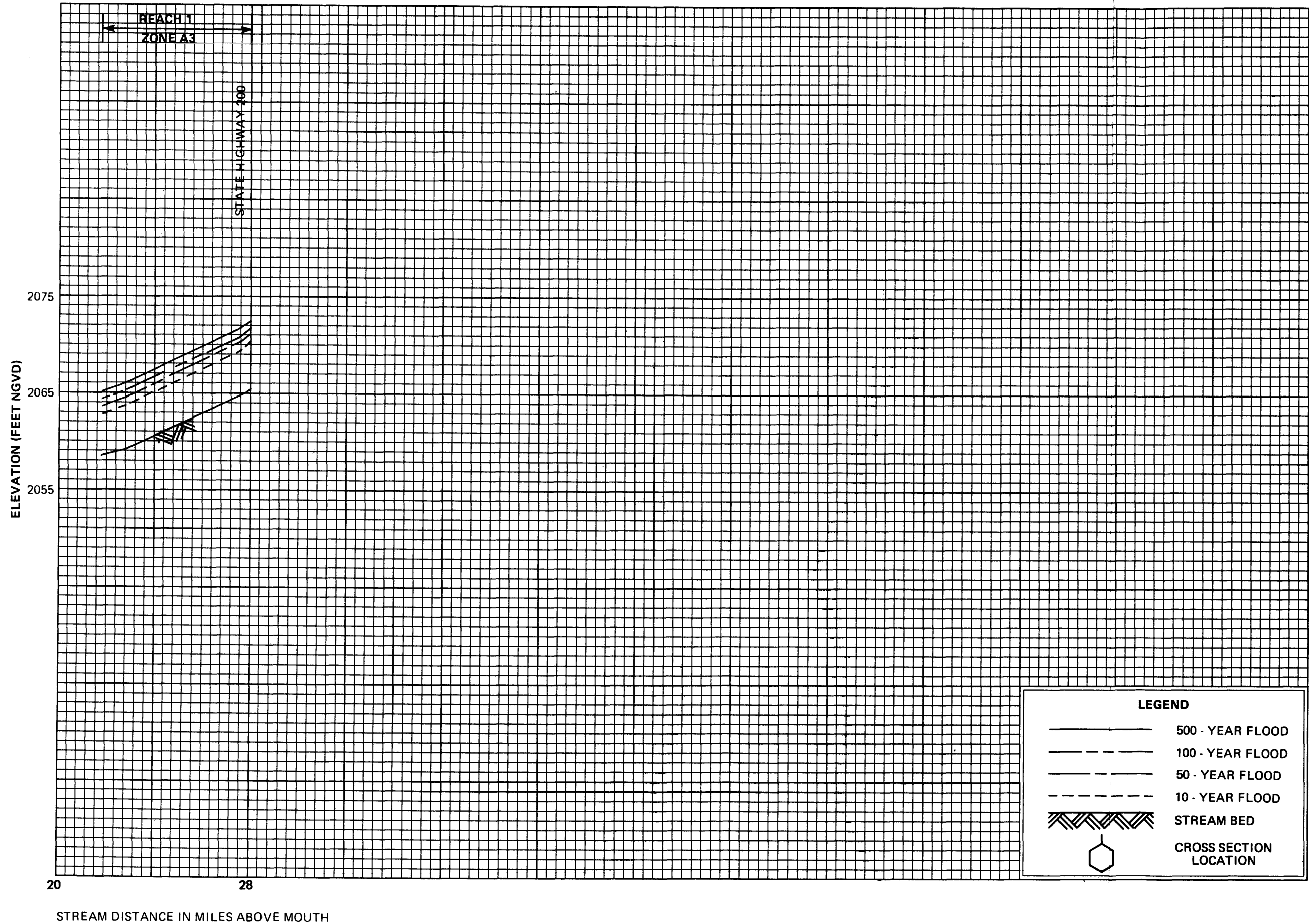
## SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 33 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

**Table 33: Bibliography and References**

Citation in this FIS	Publisher/Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
AE2S 2015	Advanced Engineering and Environmental Services, Inc.	<i>Dunn County, City of Killdeer North Dakota, Spring Creek, Gumbo Creek, Spring Creek Breakout Channel, Hydrology and Hydraulics Technical Report</i>	Advanced Engineering and Environmental Services, Inc.	Bismarck, North Dakota	January 2015	
SCS 1982	U.S. Department of Agriculture, Soil Conservation Service	<i>Flood Hazard Analyses, Spring Creek in Dunn and Mercer Counties</i>		Bismarck, North Dakota	June 1982	
	U.S. Department of Agriculture, Soil Conservation Service, Engineering Division	<i>Technical Release 61, WSP-2 Computer Program</i>			May 1976	
	U.S. Department of Agriculture, Soil Conservation Service	<i>Aerial Photographs, Spring Creek, Dunn and Mercer Counties, North Dakota, Scale 1:9,600</i>			1982	
	U.S. Department of Agriculture, Soil Conservation Service	<i>Flood Hazard Analyses, Knife River, Bismarck, North Dakota</i>			1977	

Citation in this FIS	Publisher/ Issuer	<i>Publication Title, "Article," Volume, Number, etc.</i>	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 1984	Federal Emergency Management Agency	<i>Flood Insurance Study, Dunn County, North Dakota Unincorporated Areas</i>		Washington, D.C.	1984	FEMA Map Service Center <a href="http://msc.fema.gov">http://msc.fema.gov</a>
	U.S. Department of Agriculture, Soil Conservation Service	<i>National Engineering Handbook, Section 4 Hydrology</i>		Washington, D.C.	August 1972	out of print

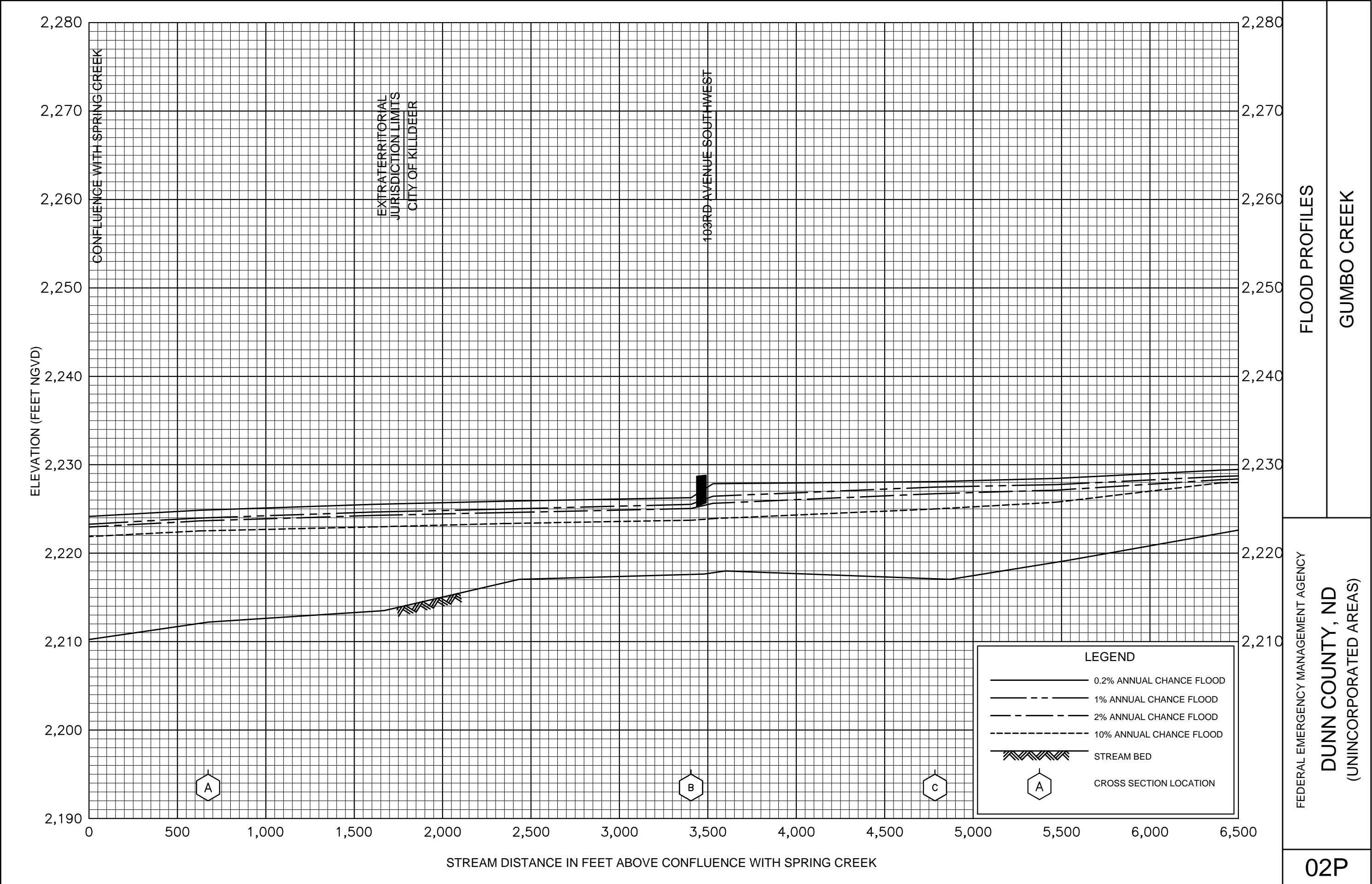


**FLOOD PROFILES**

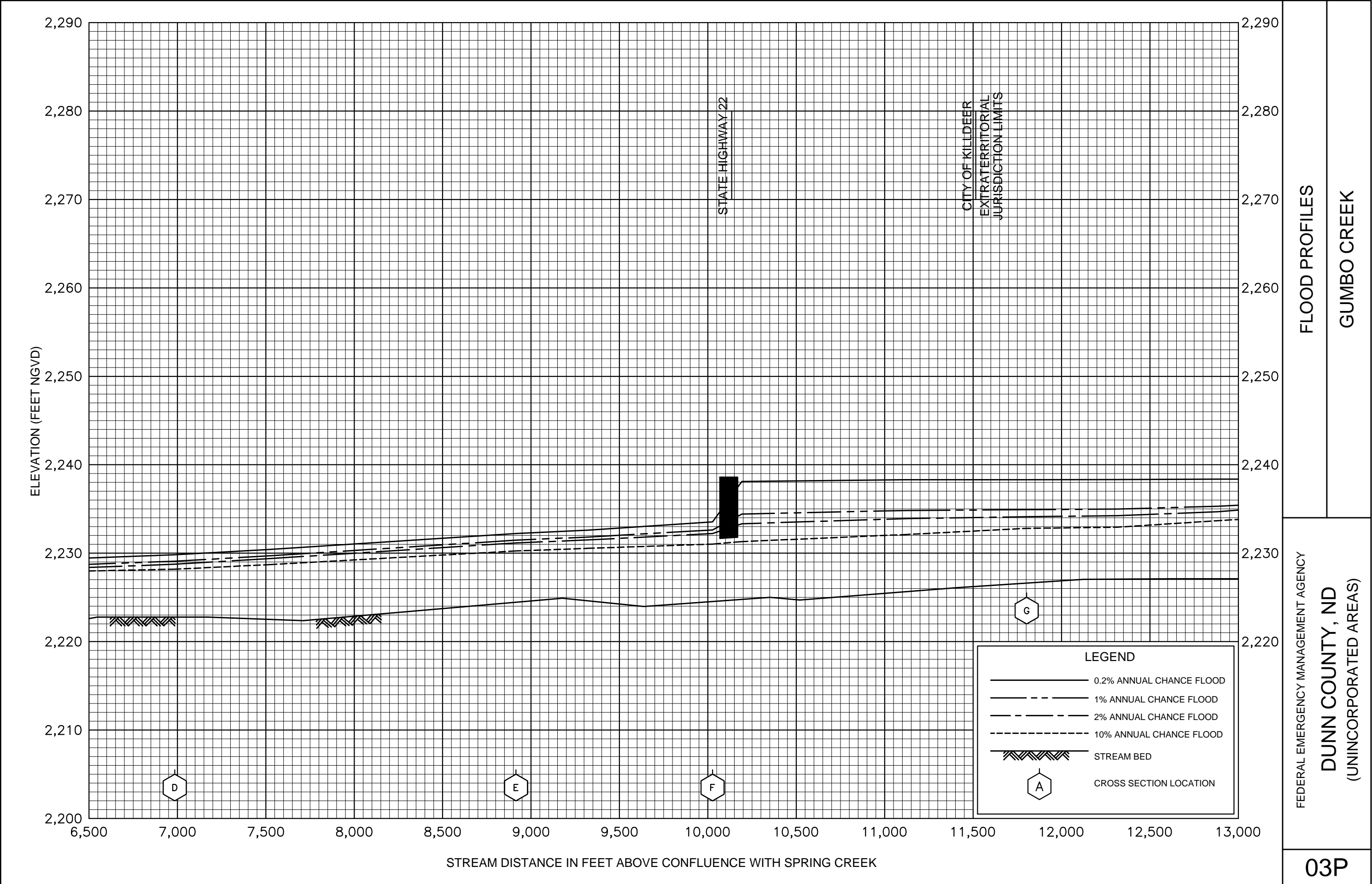
ALKALI CREEK

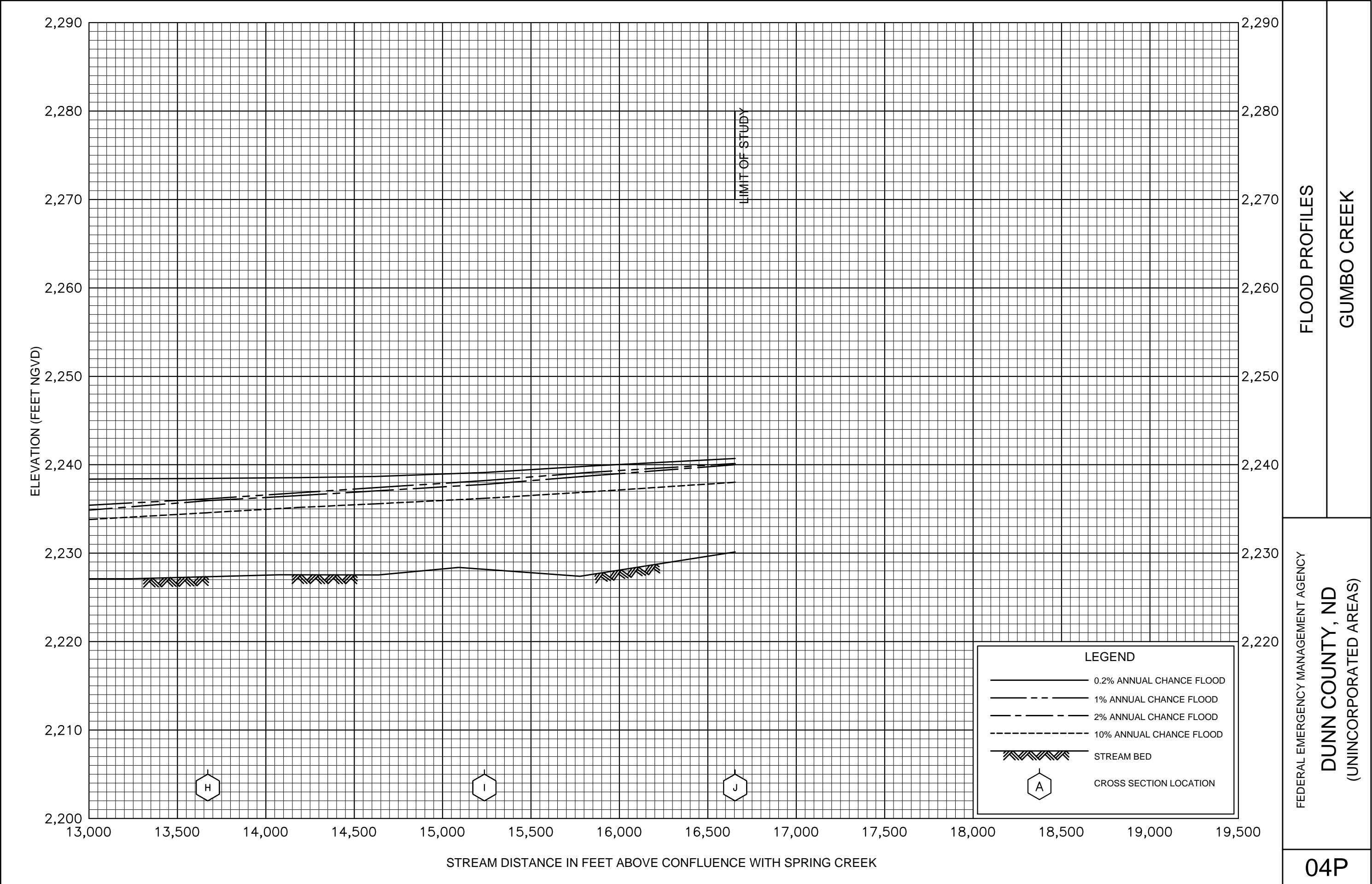
FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND  
(UNINCORPORATED AREAS)









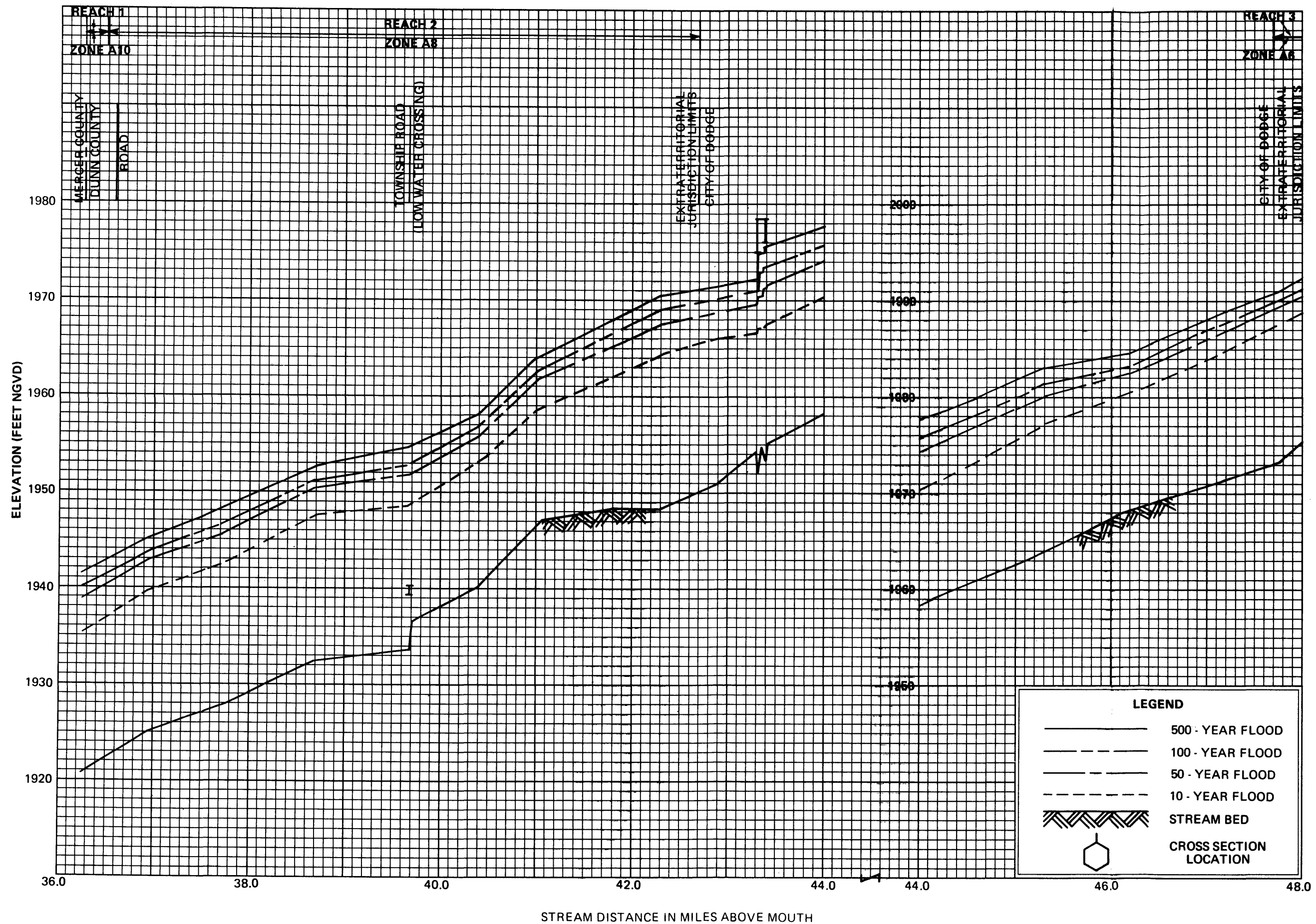
FLOOD PROFILES

GUMBO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND  
(UNINCORPORATED AREAS)

04P



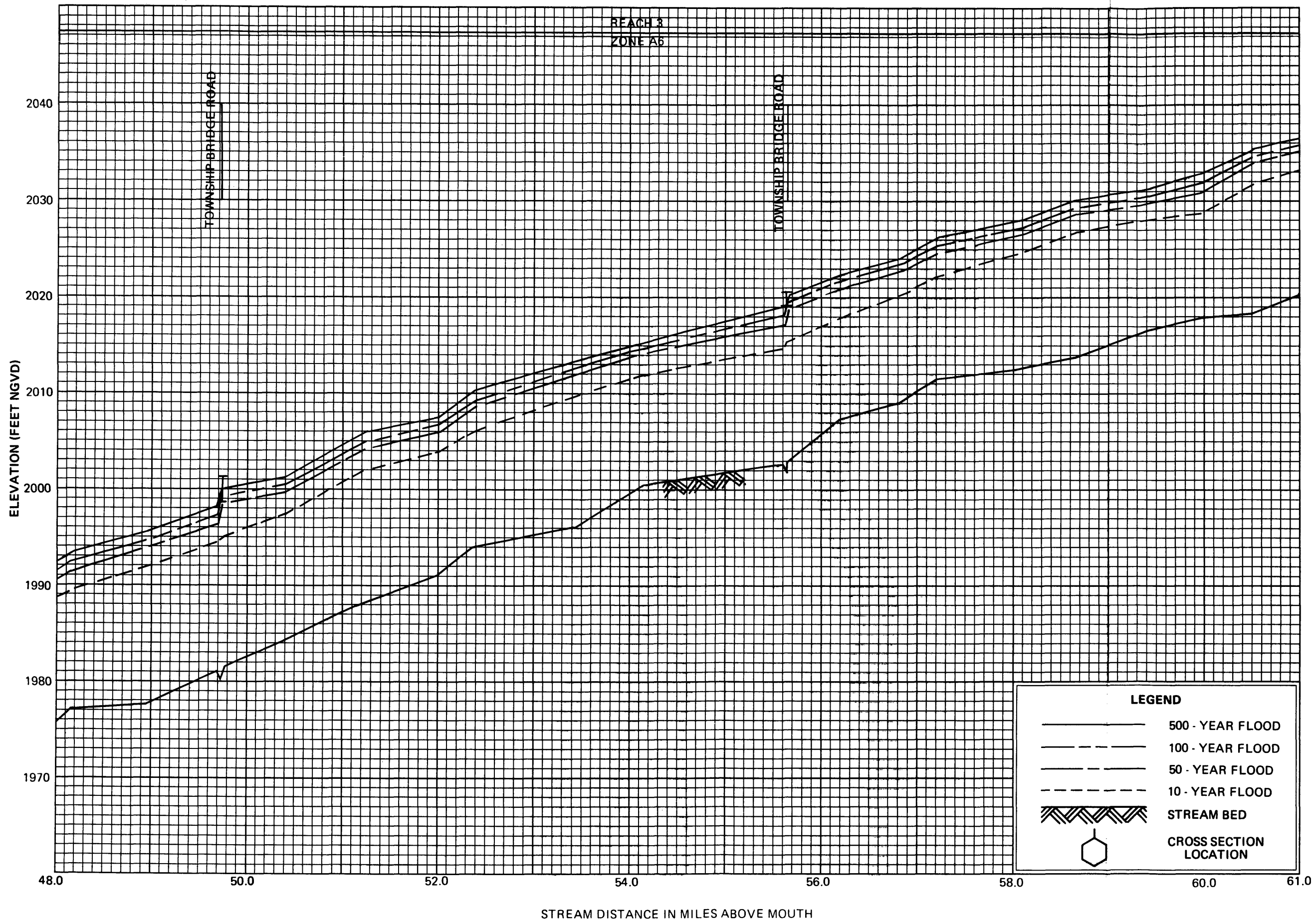
# FLOOD PROFILES

SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND  
(UNINCORPORATED AREAS)

05P



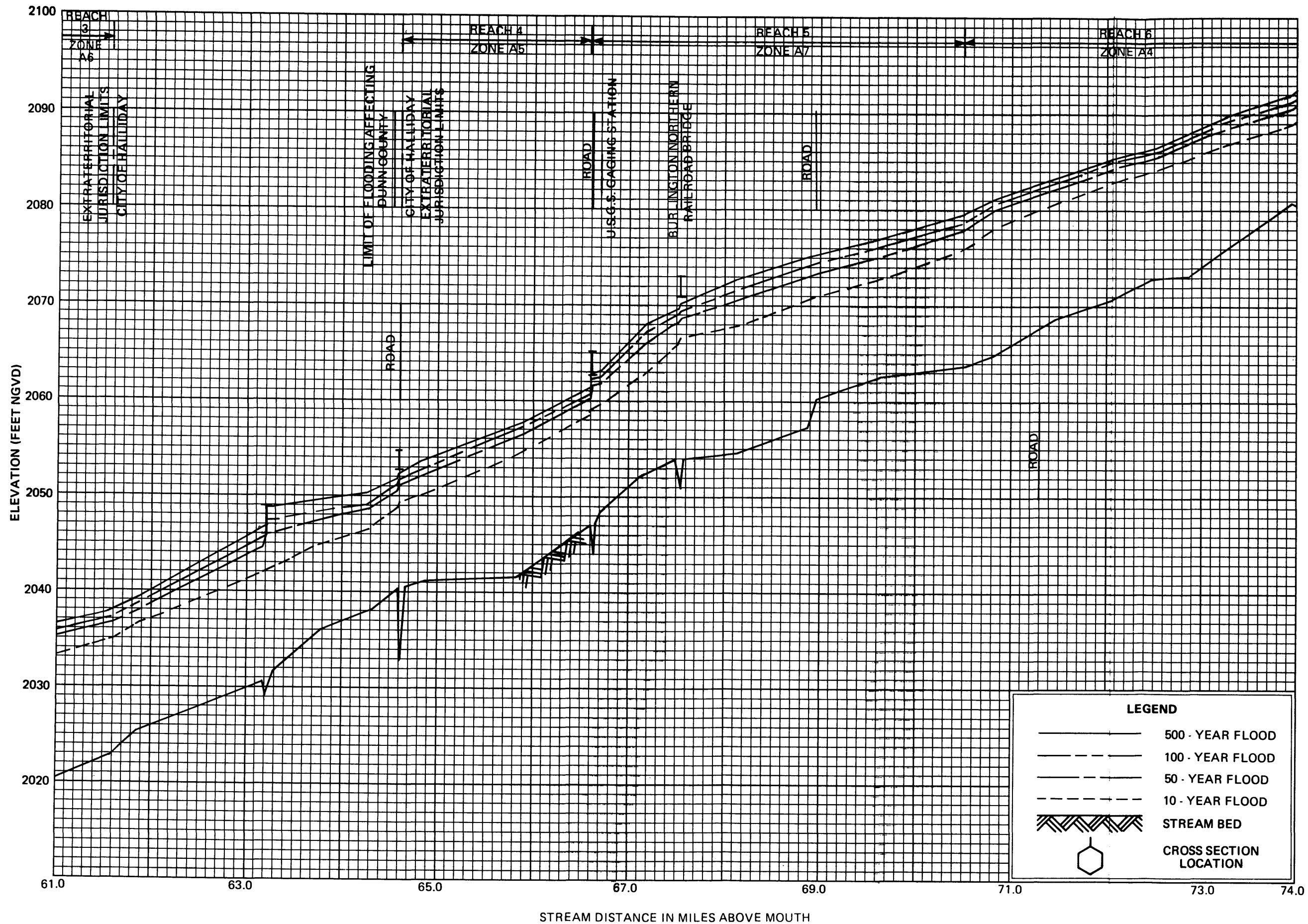
## FLOOD PROFILES

SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND  
(UNINCORPORATED AREAS)

06P



## FLOOD PROFILES

SPRING CREEK

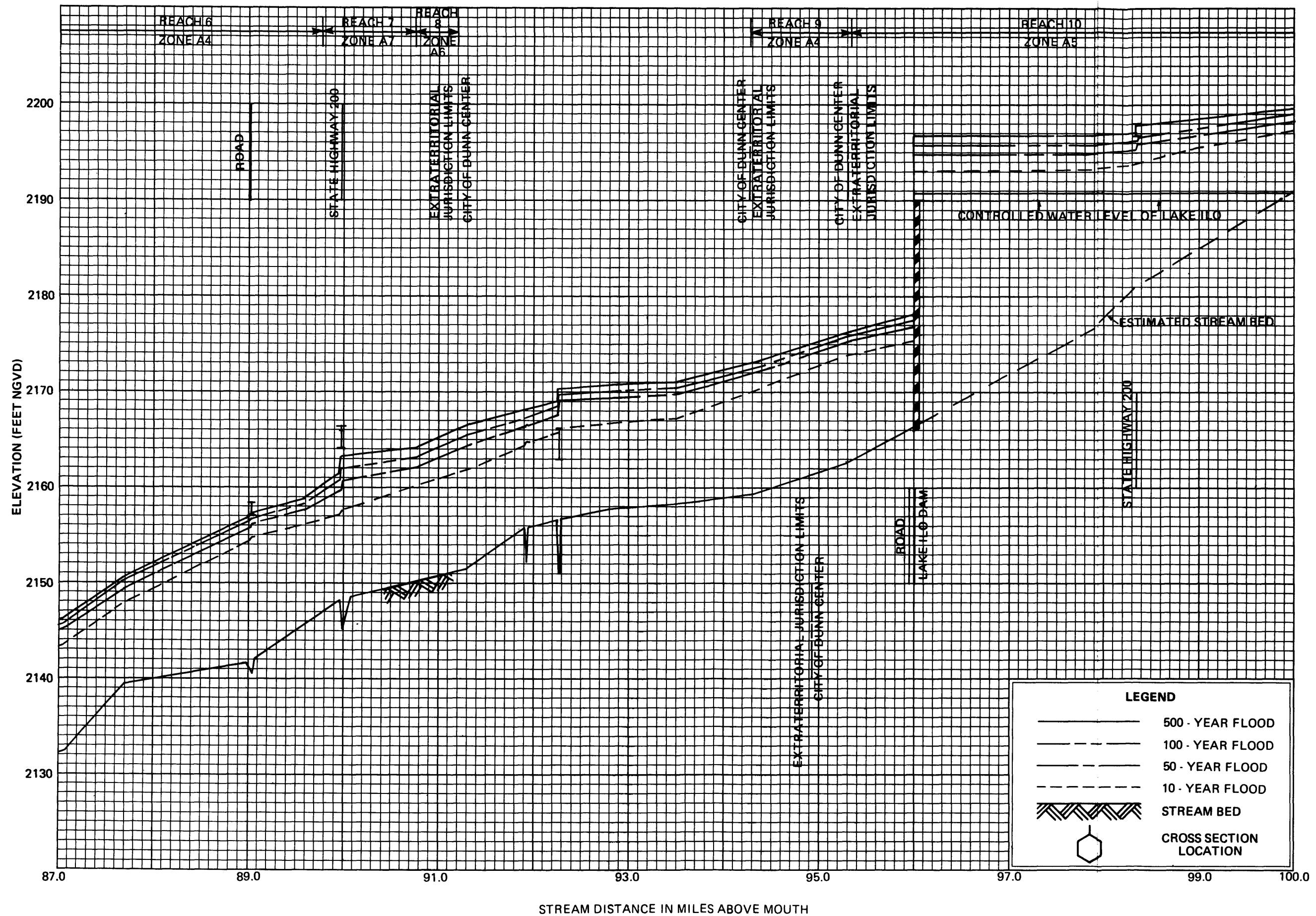
FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND  
(UNINCORPORATED AREAS)

07P







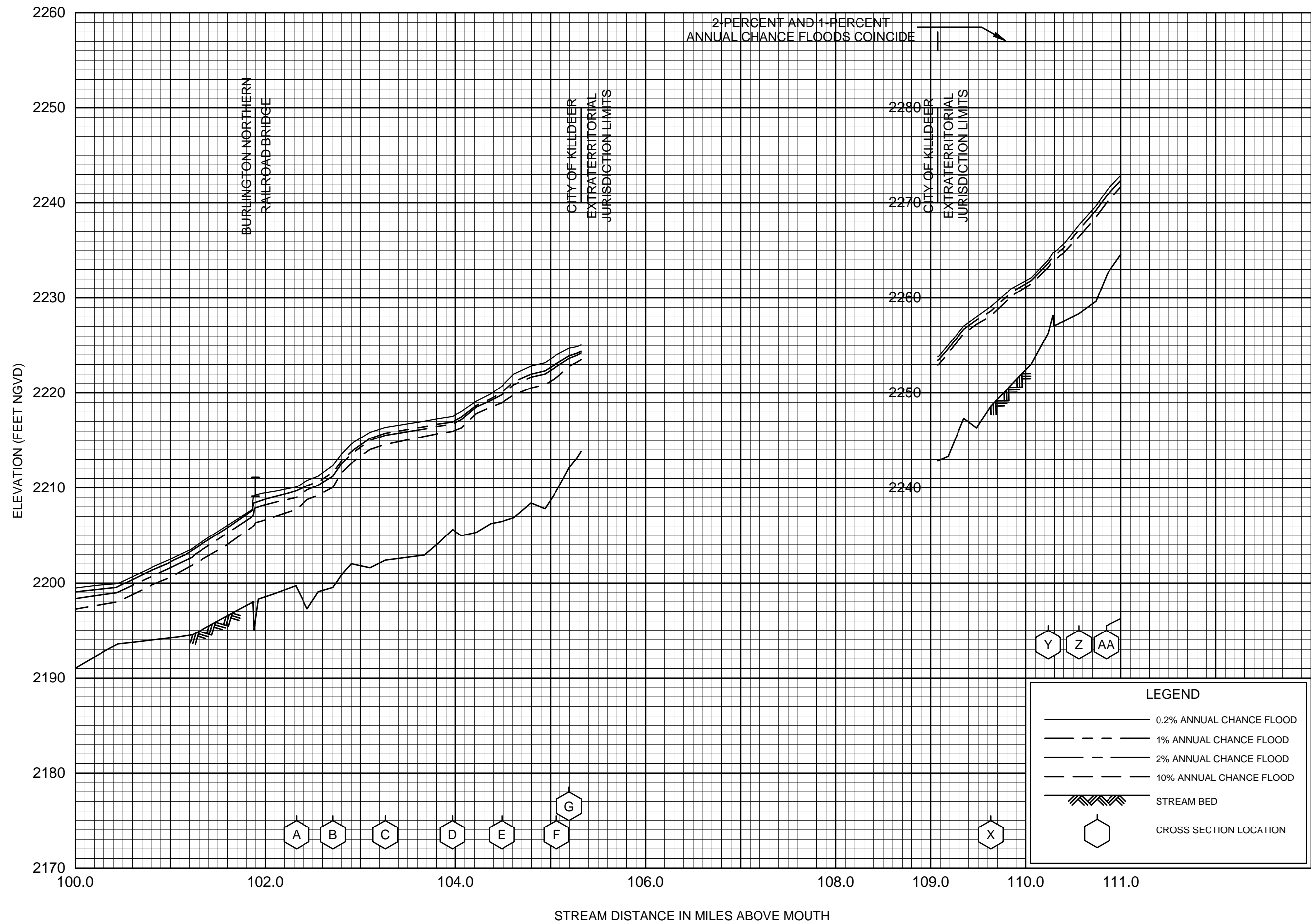
# FLOOD PROFILES

SPRING CREEK

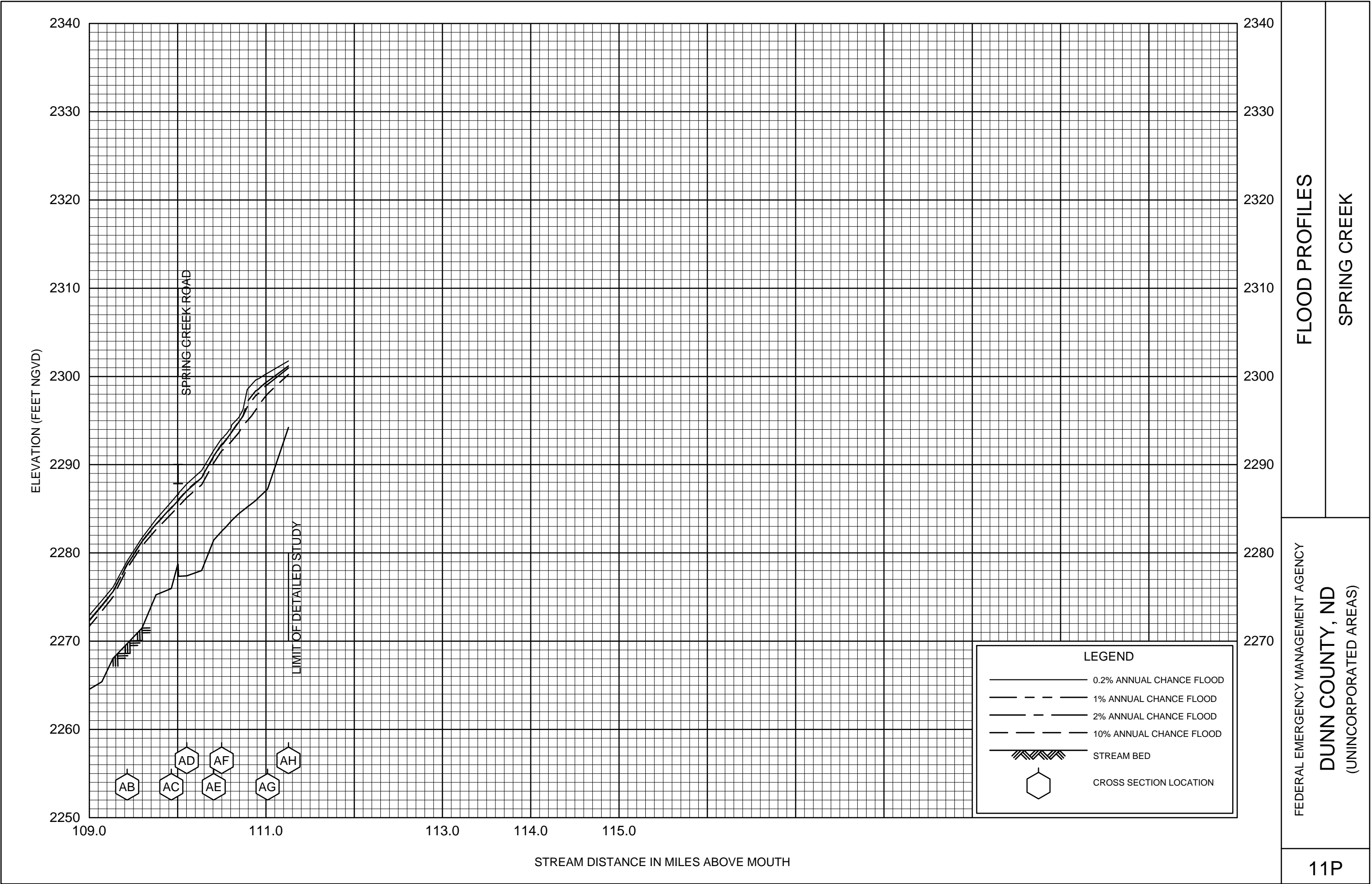
FEDERAL EMERGENCY MANAGEMENT AGENCY

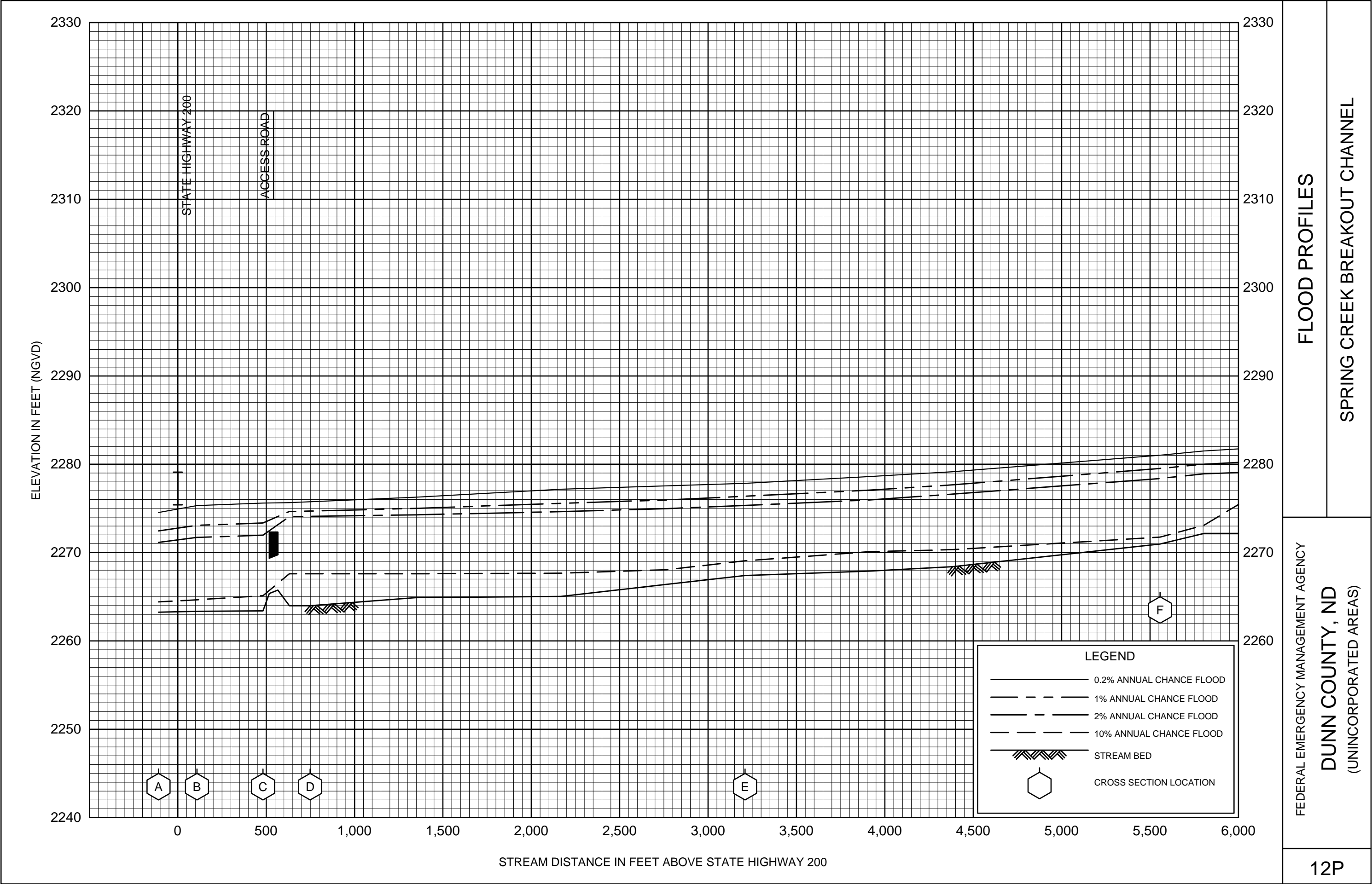
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FLOOD PROFILES

SPRING CREEK BREAKOUT CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

DUNN COUNTY, ND

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